

L 1918-66

ACCESSION NR: AP5024128

3  
case where recombination is predominant, the recombination coefficient was determined, from which the electron temperature was deduced. A comparison of this temperature with the temperature value obtained by microwave attenuation indicates satisfactory agreement of both methods. Orig. art. has: 27 formulas, 2 figures, and 2 tables.

ASSOCIATION: Fizyko-tekhnichnyy instytut AN URSR, Khar'kov (Physics-Engineering Institute, AN Ukr.SSR) 44.55

SUBMITTED: 09Nov64

ENCL: 00

SUB CODE: ME

NO REF SOV: 005

OTHER: 004

*mlr*  
Card 2/2

1. 000000 25 000000/000000-2/000000-2/000000+1/000000/mi-2 00-6/00-4/pab-10/p1-4

1. SA 10061

TOPIC TAGS: plasma interaction, plasma spectral line, charge exchange

1. Paper reports a continuation of work by some of the present authors

AP5003237

... and the electron temperature was 4 to 4.5 eV. The velocity of the ... was  $1.4 \times 10^7$  cm/sec. This was ...

... After brief discussion it is concluded that the strong interaction ... observed in these ... is ...

**"APPROVED FOR RELEASE: 08/25/2000**

**CIA-RDP86-00513R000411620003-4**

**APPROVED FOR RELEASE: 08/25/2000**

**CIA-RDP86-00513R000411620003-4"**

L 2492-66 EWT(1)/ETC/EPF(n)-2/EPA(w)-2/ENG(m) IJP(c) AT  
 UR/0057/65/035/008/1394/1400  
 ACCESSION NR: AP 5020724  
 AUTHOR: Pavilchenko, O. S.; Dushin, L. A.; Kuznetsov, Yu. K.; Adamov, I. Yu.  
 TITLE: Instability of a plasma discharge with oscillating electrons. 1. Micro-  
 wave radiation  
 SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 8, 1965, 1394-1400  
 TOPIC TAGS: plasma instability, plasma oscillation, hydrogen, helium, electric  
 discharge, electron oscillation, electron reflection, electron temperature, larmor  
 frequency, nonlinear effect, plasma magnetic field  
 ABSTRACT: The authors have investigated the microwave radiation from a high vol-  
 tage PIC reflex discharge plasma in order to obtain more information concerning  
 the oscillations discovered by G. Landauer (J. Nucl. Energy, Pt. C, 4, 395, 1962)  
 at harmonics of the Larmor frequency. The discharge took place in hydrogen or  
 helium in the presence of a uniform longitudinal magnetic field up to 2500 Oe be-  
 tween two 3.5 cm diameter cold aluminum cathodes 80 cm apart and the copper wall  
 of the 10 cm diameter, 100 cm long discharge chamber. The cathodes were located  
 within short porcelain tubes, and a potential difference up to 2 kV was maintained  
 between them and the chamber wall. Microwaves of 3.4 cm wavelength were  
 1/3

L 2492-66

ACCESSION NR: AP 5020724

UR/0057/65/035/008/1394/1400

received from the interior with a horn antenna and were recorded with a superheterodyne radiometer having a 4 Mc/sec passband. The plasma density was measured with an 0.8 cm wavelength interferometer, the electron temperature was determined from the triplet to singlet intensity ratio in the helium spectrum, and the ion temperature was determined from the Doppler broadening of spectrum lines. In the experiments the plasma densities ranged from  $10^{12}$  to  $3 \times 10^{12} \text{ cm}^{-3}$ , the electron temperatures from 20 to 50 eV, and the ion temperatures from 0.1 to 0.3 eV. The magnetic field dependence of the noise temperature at 3.4 cm was different in different regions of magnetic field strength. At low field strengths (region I) there was a single maximum at which the noise temperature reached hundreds of electron volts. At magnetic field strengths between about 200 and 1500 Oe (region II) there were many maxima whose heights did not exceed 50 eV. The heights of the region II maxima varied with the pressure and discharge current, but their positions did not; the maxima occurred at those field strengths for which an integral or half odd integral multiple of the Larmor frequency was equal to the radiometer frequency. At a magnetic field strength of perhaps 1500 Oe (depending on pressure and discharge current) there occurred a sudden decrease of the plasma density and a simultaneous increase of the noise temperature (transition to region III). In region III the noise temperature increased smoothly with increasing magnetic field, and reached

2/3

L 2492-66

18

ACCESSION NR: AP5020724

values as high as 1 keV. These phenomena and their variation with pressure and discharge current are discussed at some length and are compared with relevant observations of many other investigators. It is suggested that nonlinear effects are involved, as well as an anomalous diffusion that the authors discuss in the following paper (ZhTF, 35, 1401, 1965; see abstract AP5020725). "In conclusion, the authors express their gratitude to V.N. Orayevskiy, K.N. Stepanov, and I.F. Kharchenko for discussing the results, and to V.I. Kononenko and M.Ye. Mazharenko for assisting with the work." Orig. art. has: 7 formulas and 7 figures.

ASSOCIATION: Fiziko-tehnicheskii institut AN UkrSSR, Khar'kov (Physico-technical Institute, AN UkrSSR)

SUBMITTED: 16 Nov 64

ENCL: 00

SUB CODE: ME

NR REF SOV: 005

OTHER: 009

Card 3/3

L 2493-66 EWT(1)/ETG/EPF(n)-2/EGG(m)/EPA(w)-2 IJP(c) AT  
ACCESSION NR: AP5020725 UR/0057/65/035/008/1401/1404

AUTHOR: Pavlichenko, O. S.; Dushin, L. A.; Kuznetsov, Yu. K.; Nikol'skiy, I. K.; Adamov, I. Yu.

TITLE: Instability of a plasma discharge with oscillating electrons. 2. Anomalous diffusion of plasma

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 8, 1965, 1401-1404

TOPIC TAGS: plasma instability, plasma oscillation, helium plasma, electric discharge, electron oscillation, electron reflection, plasma diffusion, plasma magnetic field

ABSTRACT: The authors have investigated the stability and anomalous diffusion of the plasma of a high voltage PIG reflex discharge with the apparatus described in the preceding paper (ZhTF, 35, 1394, 1965; see abstract AP5020724). In addition to the measurements described in the preceding paper, measurements were made of the charged particle flux to the wall of the chamber, using a double probe, and the plasma column was observed with a rotating mirror. The charged particle flux at first decreased with increasing magnetic field, but at a certain critical field strength the flux began to increase with increasing field strength. The critical

Card 1/3



L 2493-66

ACCESSION NUR: AP 5020725

9

field was that for transition from region II to region III discussed in the preceding paper. When the magnetic field increased through the critical value the plasma density suddenly decreased, the microwave noise suddenly increased, and oscillations of the plasma column were observed with the rotating mirror. The critical magnetic field strength in helium plasmas increased with rising gas pressure from 1000 Oe at  $10^{-4}$  mm Hg to about 1600 Oe at  $2 \times 10^{-3}$  mm Hg. There was no anomaly in the electron temperature at the critical field. These results are compared with the theory of F.Hoh (Phys. Fluids, 6, 1184, 1963), and it is shown that the magnetic field strength at onset of anomalous diffusion is an order of magnitude less than the theory predicts. It is suggested that a turbulent state with a broad spectrum of low-frequency oscillations may arise from the interaction between the plasma and the oscillating electron beam. The authors hope further to pursue their studies of these phenomena. "In conclusion, the authors express their gratitude to K.D.Sinel'nikov for discussing the results and to B.I.Kononenko and M.Ye.Maznichenko for assisting with the work." Orig. art. has: 3 formulas and 4 figures.

ASSOCIATION: none

Card 2/3

L 2493-66

ACCESSION NR: AP5020725

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SUBMITTED: 16Nov64

ENCL: 00

SUB CODE: ME

NR REF SOV: 003

OTHER: 005

*beh*  
Card 3/3

ACC NR: AT5022300

SOURCE CODE: UR/3137/64/000/067/0001/0015

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Skibenko, A. I.

ORG: Physicotechnical Institute, Academy of Sciences UkrSSR (Fiziko-  
tekhnicheskii institut Akademiiya nauk UkrSSR)

TITLE: Determination of the spatial distribution of plasma density by  
microwave refraction

SOURCE: AN UkrSSR. Fiziko-tekhnicheskii institut. Doklady, no. 067/P-  
-021, 1964. Opredeleeniye prostranstvennogo raspredeleniya plotnosti  
plazmy po refraktsii mikrovoln, 1-15

TOPIC TAGS: plasma density, microwave, plasma discharge

ABSTRACT: It was shown in this work that it is possible to find the  
value of plasma density at any point on the cross section of the plasma  
by correlating the points at which the beam enters and leaves the plas-  
ma column. The experiments made use of two methods: 1) refraction of  
a microwave beam incident on the plasma cylinder at various angles to  
its axis; 2) refraction of the beam in the plane normal to the cylinder  
axis. The results from both methods agree with each other and with  
theoretical calculations. The measurements were made on a plasma column

Card 1/2

L 12863-66

ACC NR: AT5022300

2  
2 m long and 100 mm in diameter, produced by electrodeless discharge. The advantage of these methods over older methods is that only one probing frequency is needed. The use of these methods for investigating quasiconstant and constant plasma simplifies the process of determining density distribution. Present methods can be improved by using microwave beams with smaller apertures and higher frequencies and by using several frequencies. A description of the experimental apparatus is given; oscillograms showing receiver signals for various conditions are presented together with a schematic diagram of transmitter and receiver positions relative to the plasma column. The authors consider it their pleasant duty to thank K. I. Stepanov and V. P. Sizonenko for their valuable discussion of the results and for acquainting us with their work in this direction before it was published. Orig. art. has: 11 figures.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 004/ OTH REF: 001

Card 2/2

HW

ACC NR: AT5029593

7-1111-2/EMJ(m)/EWA(m)-2 LTP(c) AT/GS  
SOURCE CODE: UR/0000/65/000/000/0512/0519

AUTHOR: Dushin, L. A.; Privezentsev, V. I.; Skibenko, A. I.

ORG: none

TITLE: Use of transverse extraordinary waves in plasma diagnostics

SOURCE: Konferentsiya po fizike plazmy i problemam upravlyayemogo termoyadernogo sinteza, 4th, Kharkov, 1963. Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza (Physics of plasma and problems of controllable thermonuclear synthesis); doklady konferentsii, no. 4. Kiev, Naukova dumka, 1965, 512-519

TOPIC TAGS: plasma diagnostics, microwave spectroscopy, gas discharge spectroscopy

ABSTRACT: The extraordinary wave is used in conjunction with the usually employed ordinary wave to expand the microwave diagnostic techniques to the measurement of both electron density and collision frequency in a plasma. It is shown that the form of the dielectric constant associated with the extraordinary wave determines three electron density values (all within a factor of 2 for magnetic field of 310 kA/m). This was also confirmed experimentally and shown to be in agreement with the control data obtained using the ordinary wave. In the case when collisions in the plasma cannot be neglected, it is necessary to consider the attenuation of the extraordinary wave, which depends on magnetic field intensity, collision frequency, and density. An

Card 1/2

L 10224-66

ACC NR: AT5028593

attenuation coefficient is plotted for several sets of these parameters. This is in turn used with the ordinary wave cut-off data to obtain the collision frequency. Experimental data obtained by using both waves (8 mm wavelength) is used to determine the collision frequency in the decaying plasma of a pulsed Phillips discharge. Phase changes in the transmitted wave are also briefly discussed and it is pointed out that its measurement can be useful for diagnostics only at higher magnetic fields.

[14]

SUB CODE: 20

SUBM DATE: 20May65/

ORIG REF: 003/

OTH REF: 001

ATD PRESS: 4163

Card 2/12

L 10238-66 EWT(1)/ETC/EPF(n)-2/ENG(m) LJP(c) AT/CS  
 ACC NR: AT5028594 SOURCE CODE: UR/0000/65/000/000/0519/0526

AUTHOR: Dushin, L. A.; Privezentsev, V. I.; Skibenko, A. I.

ORG: none

TITLE: Microwave methods of plasma diagnostics employing longitudinal propagation of radiowaves

SOURCE: Konferentsiya po fizike plazmy i problemam upravlyayemogo termoyadernogo sinteza. 4th, Kharkov, 1963. Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza (Physics of plasma and problems of controllable thermonuclear synthesis); doklady konferentsii, no. 4, Kiev, Naukova dumka, 1965, 519-526

TOPIC TAGS: plasma diagnostics, microwave spectroscopy

ABSTRACT: Application of microwaves propagating in plasma along the direction of the external magnetic field is considered in order to broaden the scope of measurements of plasma parameters. The general form of the index of refraction for both ordinary and extraordinary waves which is valid for some arbitrary direction of the magnetic field relative to the direction of the incident wave is considered. The form of the phase and the attenuation coefficient for the wave in the same degree of generalization is also utilized. Both hold for situations where the collision frequency is not negligible. The values of magnetic field density and collision frequency

Card 1/2

L 10238-66

ACC NR: AT5028594

quency are delineated to establish the regions of propagation of ordinary and extraordinary waves. Additionally, it is pointed out that since the travel time of the probing microwave signal depends on the plasma density (and is inversely proportional to group velocity), the delay between sending and receiving the signal can also be utilized for determination of plasma parameters. For this purpose, the group velocity for various densities and magnetic fields is plotted for both types of waves. The phase relation, attenuation coefficient, and the delay time were used in an experimental study of plasma parameters. Maximum magnetic field obtainable was 796 karp/m. To check these results a transversely propagating wave of shorter wavelength was also used. The measurements so obtained confirm the validity of the new method described in this work. The new method can be used to study plasmas with densities higher than the cutoff density and make it possible to determine the collision frequency at the same time. Orig. art. has: 8 figures, 9 formulas.

[14]

SUB CODE: 09, 17/  
ATD PRESS: 4163

SUBM DATE: 20May65/

ORIG REF: 003/

OTH REF: 002

Card 2/2



L 10237-66 EWT(1)/ETC/EPF(n)-2/ENG(m) LJP(c) AT/GS  
 ACC NR: AT5028595 SOURCE CODE: UR/0000/65/000/000/0526/0532

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Pavlichenko, O. S.; Nikol'skiy, V. K.;  
 Brzhechko, L. V.

ORG: none

TITLE: Microwave and spectroscopic investigation of an electrodeless induction discharge

SOURCE: Konferentsiya po fizike plazmy i problemam upravlyayemogo termoyadernogo sinteza. 4th, Kharkov, 1963. Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza (Physics of plasma and problems of controllable thermonuclear synthesis); doklady konferentsii, no. 4. Kiev, Naukova dumka, 1965, 526-532

TOPIC TAGS: plasma diagnostics, plasma pinch, microwave plasma, microwave spectroscopy, gas discharge spectroscopy

ABSTRACT: Plasma heating experiments where conditions favorable to strong microwave emission occur are described. The apparatus used for production of microwaves is a theta-pinch device with maximum mirror magnetic field of  $1.3 \cdot 10^{-6}$  a/m having a period of  $8.6 \cdot 10^{-6}$  sec and employing high frequency preionization. Microwave and optical diagnostics were used to determine the plasma parameters. Three microwave signals with a wide range of frequencies (9.4 Gc, 37 Gc, 140 Gc) were used to probe the

Card 1/3

L 10237-66

ACC NR: AT5028595

plasma outside and within the theta coil region. It was established using microwave propagation perpendicular to the plasma (and magnetic field) axis that a plasma density higher than  $2.4 \times 10^{14} \text{ cm}^{-3}$  exists for  $6.0 \times 10^{-5} \text{ sec.}$  Density vs time plots are given for different capacitor voltages (driving the theta-pinch discharge). The measurements indicate that the plasma density outside the coil region decreases in accordance with a diffusion mechanism while the plasma inside the theta-coil region decreases due to some more rapid loss mechanism. The spectral measurements show that the hydrogen is highly ionized, radiating only at magnetic field minima. The impurity lines also appear at these minima, while at other times continuum radiation dominates. The charged-particle densities are shown to increase with the initial pressure as determined from the line width of  $H_{\beta}$ . In addition, electron temperature history was determined from observation of singlet and triplet lines of  $H_{\epsilon}$  which was

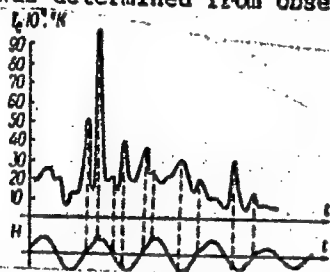


Fig. 1. Variation of  $T_e$  with time  
 $p = 1.3 \text{ N/m}^2$   $U = 20 \text{ kv}$

introduced in small quantities. Electron temperature ( $T_e$ ) peaks occurred during both maximum electric and maximum magnetic fields (Fig. 1). Both microwave and spectral measurements were found to be consistent. Orig. art. has: 9 figures. [14]

Card 2/3

ACC NR: AT5028595

SUB CODE: 09

SUBM DATE: 20May65/ ORIG REF: 003/ OTH REF: 004/ ATD PRESS:

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Card <sup>m</sup> 3/3

DUSHIN, L.A. [Dushyn, L.O.]; KONONENKO, V.I.; KOVTUN, R.I.; PRIVEZENTSEV,  
V.I. [Pryvezentsev, V.I.]; SKIBENKO, A.I. [Skybenko, A.I.]

Use of an interferometer and the microwave cut-off method in  
studying a plasma. Ukr. fiz. zhur. 10 no.9:977-984 S '65.  
(MIRA 18:9)

1. Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov.

L 16088-66 EPF(n)-2/EWT(1)/ETC(f)/EWG(m) IJP(c) AT

ACC NR: AP5027660

SOURCE CODE: UR/0051/65/019/005/0674/0679

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Pavlichenko, O. S.; Nikol'skiy, I. K.

ORG: none

TITLE: Damping radiation in the infrared region of the spectrum of plasma under electrodeless induction discharge

94  
B

SOURCE: Optika i spektroskopiya, v. 19, no. 5, 1965, 674-679

TOPIC TAGS: plasma diagnostics, hydrogen, germanium, photoresistor, IR radiation

ABSTRACT: The authors investigated the damping radiation in the infrared region of the spectrum of an electrodeless induction discharge of hydrogen. The damping radiation in the region of 1.8 - 9.5 mk wave length was registered by a germanium photoresistor operating under the temperature of liquid nitrogen. The density of the plasma was determined based on the results obtained from measuring the temperature of plasma electrons and the intensity of damping radiation. The proposed method could be used for diagnostics of a dense plasma. The authors express thanks to A. F. Plotnikov and G. N. Zhizhin. (Orig. art. has: 6 figures and 8 formulas.)

21,44155

Card 1/2

UDC: 537.525.1-15

L 16088-66

ACC NR: AP5027660

SUB CODE: 20 / SUBM DATE: 17Aug64/ ORIG REF: 002/ OTH REF: 004

Card 2/2

L 23096-66 EWT(1)/ETC(f)/EPF(n)-2/ENG(m) IJP(c) AT

ACC NR: AP6007079

UR/0057/66/036/002/0304/0312

AUTHOR: Dushin, L.A.; Kononenko, V.I.; Sizonenko, V.L.; Skibenko, A.I.; Stepanov, E.N.

ORG: None

TITLE: Determination of plasma density distribution by microwave refraction

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 2, 304-312

TOPIC TAGS: plasma diagnostics, plasma density, plasma decay, microwave, electromagnetic wave refraction

ABSTRACT: Fermat's principle is employed to calculate the path of a microwave beam in a cylindrical plasma in which the density decreases monotonically with increasing distance from the axis for the two cases in which the beam lies in a plane containing the axis of the plasma cylinder or in a plane perpendicular to the axis. For each case there is derived an equation that gives the plasma density as a function of the distance from the axis implicitly in terms of the position at which the microwave beam leaves the plasma as a function of the angle of incidence. It is proposed that these equations be used to determine plasma density distributions from microwave refraction measurements. The proposed techniques were tested by measuring density distributions in decaying hydrogen plasmas at  $5 \times 10^{-2}$  mm Hg in a 2 m long 10 cm diameter quartz tube. The apparatus is described in more detail elsewhere by I. Adamov, L. Dushin, V. Kononenko,

Card 1/2

UDC: 533.9

L 23096-66

ACC NR: AP6007079

and O.Pavlichenko (Atomnaya energiya, 16, No. 2, 99, 1964). Microwaves of 8 mm wavelength were employed, and the radiating and receiving horns were provided with dielectric lenses that rendered the beam nearly parallel. For each run the antennas were held in fixed positions and the time after excitation of the plasma at which the refracted wave was received by the receiving antenna was recorded with an oscilloscope. Many such runs were made with the antennas in different positions and inclined at different angles, and from the accumulated data curves were constructed giving the position of the antenna as a function of the incidence angle for different times. From these curves the electron density of the plasma was calculated as a function of time and distance from the axis. Measurements were made both with the beam in a plane containing the axis of the plasma cylinder and with the beam in a plane perpendicular to the axis. Good agreement was obtained between the different measurements, and it is concluded that the proposed techniques are satisfactory. The techniques can be improved by employing narrower microwave beams and shorter wavelengths. It is also possible to vary the wavelength instead of the incidence angle. Orig. art. has: 14 formulas and 12 figures.

SUB CODE: 20/

SUBM DATE: 22Feb65/

ORIG REF: 001/

OTH REF: 002

Card 2/2 *UUR*



L 23569-66 EWT(l)/EPF(n)-2/ETC(f)/EWG(m) IJP(c) AT/GS	
ACC NR: AT6008860	SOURCE CODE: UR/0000/65/000/000/0198/0206
AUTHOR: <u>Dushin, L. A.; Kononenko, V. I.; Paviichenko, O. S.; Nikol'skiy, I. K.</u>	
ORG: none	
TITLE: Bremsstrahlung of a $\theta$ -pinch plasma in the infrared spectral region <span style="float: right;">55 D+1</span>	
SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965, 198-206	
TOPIC TAGS: bremsstrahlung, plasma pinch, electron temperature, plasma density, IR spectrum	
ABSTRACT: The authors review the various methods used for determining the parameters of a plasma from the intensity of Bremsstrahlung. If the receiver design does not permit wavelength adjustment, the absolute intensity of the Bremsstrahlung in the plasma is measured in a definite wavelength range and an independent method is used for determining one of the parameters of the plasma, e. g. the electron temperature, and its variation with time. These data are then used as a basis for determining the plasma density and its variation. The possibilities of using this type of a receiver for plasma diagnosis are discussed. Experiments were conducted which showed that the continuous radiation of a plasma in the near infrared region may be measured simultaneously with the electron temperature to determine the density of the plasma and its	
Card 1/2	

L 23569-66

ACC NR: AT6008860

variation with time. The sensitivity of this method may be improved by reducing the band of the preamplifier of the recording system and by making the measurements on a plasma in which slower processes take place since this would allow covering a wider density range. Orig. art. has: 5 figures, 4 formulas.

SUB CODE: 20/

SUBM DATE: 20Oct65/

ORIG REF: 000/

OTH REF: 003

Card 2/2

PB

L 23564-66 EWT(1)/ETC(f)/EPF(n)-2/ENG(m) IJP(c) GS/AT

ACC NR: AT6008857

SOURCE CODE: UR/0000/65/000/000/0166/0179

AUTHOR: Dushin, L. A.; Kovtun, R. I.; Privezentsev, V. I.; Skibenko, A. I. 7/ B+1

ORG: none

TITLE: Microwave refraction by a nonhomogeneous <sup>2/</sup> cylindrical plasma

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965, 166-179

TOPIC TAGS: microwave, plasma density, plasma physics, distribution function

ABSTRACT: The authors consider transmission of microwave beam through a cylindrical plasma with radial density distribution of the form

$$\frac{N(r)}{N_{cr}} = k[1 - (\frac{r}{r_0})^2]$$

where  $k = \frac{N_{max}}{N_{cr}}$  and  $N_{max}$  is the density at the axis of the cylinder. This ex-

pression is integrated with respect to the radius and then averaged to give

$$\gamma = \frac{\bar{N}/N_{max}}{1 - \bar{N}/N_{max}} = \frac{\bar{N}}{N_{max} - \bar{N}}$$

Card 1/2

L 23564-66

ACC NR: AT6008857

where  $\bar{N}$  is the density averaged with respect to the radius. Thus a distribution function may be easily found which gives a nearly homogeneous form of distribution at large  $\gamma$  and is close to a  $\delta$ -function when  $\gamma \rightarrow 0$ , by simultaneously measuring the maximum density and the density averaged with respect to the radius. The trajectory of a microwave beam in a cylindrical plasma is calculated and the effect of beam distortion during measurement of signal attenuation is considered. Experiments are conducted to determine the density distribution in a discharge column. The experimental data are analyzed on the basis of the formulas derived in the paper. Orig. art. has: 8 figures, 21 formulas.

SUB CODE: 20/

SUBM DATE: 20Oct65/

ORIG REF: 006/

OTH REF: 004

Card 2/2 FV

L 23567-66 EWT(1)/EPF(n)-2/ETC(f)/EWG(m) IJP(c) GS/AT

ACC NR: AT6008958

SOURCE CODE: UR/0000/65/000/000/0179/0188

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Skibenko, A. I.

ORG: none

TITLE: Using microwave refraction to determine the spatial density distribution of a plasma

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965, 179-188

TOPIC TAGS: distribution function, microwave, plasma density, plasma physics

ABSTRACT: A method is proposed for using refraction of microwave beams to determine the spatial density distribution of a plasma on the basis of a single probing frequency for any moment of time. The method is applicable both to the case of a flat plasma and also for cylindrical plasma formations. In the case of a plasma with a plane or nearly flat surface, the spatial distribution may be found from the refraction of microwave beams which are incident at an angle to the surface of the plasma. There is a continuous change in the direction of the microwave beam due to the density gradient in the plasma. Analytical formulas are given for determining the density distribution from the trajectory of the beam in the plasma. When the plasma being studied is axially symmetric, the spatial density distribution may be determined from the refraction

Card 1/2

L 23567-66

ACC NR: AT6008858

of microwave beams in a plane normal to the axis of the discharge. The use of this method is discussed. The proposed methods may be improved by using microwave beams with small apertures and by operation on shorter wavelengths. Orig. art. has: 9 figures, 8 formulas.

SUB CODE: 20/

SUBM DATE: 20Oct65/

ORIG REF: 004/

OTH REF: 001

Card 2/2

L 39553-66 EWT(1)/TIF(n)-2/ETC(f)/BWC(m) IJP(c) AT/OS/GD  
 ACC NR: AT6008859 SOURCE CODE: UR/0000/65/000/000/0189/0198.

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Kovtun, R. I.; Privezentsev, V. I.;  
 Skibenko, A. I.

ORG: none

TITLE: Studying a plasma by probing with microwaves

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965,  
 189-198

TOPIC TAGS: microwave, plasma structure, plasma density, distribution function

ABSTRACT: The authors determine the spatial density distribution function for a plasma by comparing the average density measured by a microwave interferometer with the maximum density determined from the cutoff time of the microwave signals. These data were used for finding the recombination and diffusion coefficient and for estimating the electron temperature in the discharge. The experimental procedure is described in detail and the derivation of the analytical formulas used in the work is discussed. It is shown that curves for the average and maximum plasma densities or their logarithms as functions of time will coincide as long as there is no noticeable diffusion to destroy the initial distribution. The results confirm the data in the literature obtained by spectroscopic analysis of a Phillips discharge. Orig. art. has: 4 figures, 17 formulas.

SUB CODE: 20/ SUBM DATE: 20Oct65/ ORIG REF: 005/ OTH REF: 002

Card 1/1 H/S

L 04749-67	ENT(1)	IJP(c)	AT/ED
ACC NR: AT6020452	(N)	SOURCE CODE: UR/0000/65/000/000/0204/0216	
AUTHOR: <u>Pavlichenko, O. S.; Dushin, L. A.; Kuznetsov, Yu. K.; Adamov, I. Yu.</u> 63			
ORG: none B+1			
TITLE: Instability of plasma discharge with oscillating electrons			
SOURCE: AN UkrSSR. Vzaimodeystviye puchkov zaryazhennykh chastits s plazmoy (Interaction of charged particle beams with plasma). Kiev, Naukova dumka, 1965, 204-216			
TOPIC TAGS: plasma discharge, plasma instability, plasma interaction, plasma diffusion			
ABSTRACT: The experiments described in the present work revealed that cyclotron harmonics found in radiation from plasma with oscillating electrons and radiations induced by plasma oscillations are of a non-thermal nature and that their source is plasma microinstability. Two types of experiments were performed: observation of microwave emission from the plasma, and determination of the diffusion rates in the plasma. The experiments were performed on a discharge column (hydrogen or helium) of relatively high density ( $10^{12} \text{ cm}^{-3}$ ) and high temperature (50 ev). The experimental results are described and analyzed to show the importance of the beam-plasma interaction. It is shown that although the instability is microscopic in nature, it cannot be explained in terms of the model of F. C. Hoh ( <i>Phys. Fluids</i> , 1963, 6, 1104). The complex relation-			
Card 1/2			



L 04749-67

ACC NR: AT6020452

ship between the parameters of oscillating electron beams and the plasma gives only qualitative answers at present, but does not allow formulation of the rules for the observed anomalous diffusion. The authors also include a review of the most important experimental and theoretical results dealing with this problem. Orig. art. has: 11 figures, 3 formulas.

SUB CODE: 20/

SUBM DATE: 11Nov65/

ORIG REF: 007/

OTH REF: 007

Card 2/2 2b

L 35972-66 EWT(1) RB

ACC NR: AP6016041

(N)

SOURCE CODE: UR/0185/66/011/005/0491/0496

AUTHORS: Hryhorenko, V. H. -- ~~Grigorenko, V. G.~~; Dushyn, L. O. -- ~~Dushin,~~  
L. A.; Leontovych, K. A. -- ~~Leontovich, K. A.~~ 5/  
B

ORG: Physicotechnical Institute, AN UkrSSR, Khar'kov (Fizyko-tekhnichyy  
instytut AN URSR)

TITLE: Microwave interferometers with amplitude modulation

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 11, no. 5, 1966, 491-496

TOPIC TAGS: interferometer, amplitude modulation, phase measurement,  
PHASE SHIFT

ABSTRACT: An analysis has been made of problems in designing micro-  
wave interferometers with amplitude modulation, which permit transfer-  
ing the phase shift measurement from the microwave band to the radio-  
frequency band. A description of possible interferometer layouts is  
given. Orig. art. has: 8 figures. [Based on authors' abstract] [NT]

SUB CODE: 09 / SUBM DATE: 10Jul65/ ORIG REF: 003/OTH REF: 004

L 01279-67 EMT(1) IJP(c) AT  
 ACC NR: AT6031154 SOURCE CODE: UR/3137/66/000/197/0003/0011

AUTHOR: Dushin, L. A.; Kuznetsov, Yu. K.; Pavlichenko, O. S.

56  
53

ORG: none

2/

B+1

TITLE: Drift instability of a discharge plasma with oscillating electrons

SOURCE: AN UkrSSR. Fiziko-tekhnicheskii institut. Doklady, no. 197/P-063, 1966. Dreyfovaya neustoychivost' plazmy razryada s ostsilliruyushchimi elektronami, 3-11

TOPIC TAGS: discharge plasma, plasma oscillation, drift instability, oscillating electron, drift dissipation

ABSTRACT: A study is made of previously observed increases in charged particle flux across a magnetic field, created by the discharge of oscillating electrons which produce intense low-frequency plasma oscillations. A study of these oscillations, and their genesis and frequency of occurrence as a function of plasma parameters, suggests that they are caused by the drift-dissipation instability of nonhomogeneous plasma. The phenomenon had been earlier analyzed theoretically by

Card 1/2

L 01279-67

ACC NR: AT6031154

A. V. Timofeyev. The authors thank K. D. Sinel'nikov, V. T. Tolok,  
and Ya. B. Faynberg for their discussion of the results obtained. <sup>3</sup>  
Orig. art. has: 5 figures. [Authors' abstract] [SP]

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 008/ OTH REF: 004

L 03005-67 EWT(1) IJP(c) AT

ACC NR: AP6033420

SOURCE CODE: UR/0057/66/036/010/1842/1850

AUTHOR: Dushin, L. A.; Kononenko, V. I.; Skibenko, A. I.

ORG: none

TITLE: A study of spatial density distribution of plasma by refraction of a microwave ray with several frequency components

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 10, 1966, 1842-1850

TOPIC TAGS: plasma density, plasma charged particle, plasma structure

ABSTRACT: Measurement of spatial distribution density of non-uniform plasma by refraction of a microwave ray having several frequency components was studied. Spatial distribution density was measured in a plane normal to and in a plane passing through the axis of a decaying plasma cylinder formed by pulsed induction discharge. Measurements were made by refracting microwave rays in a plane containing the cylinder axis and in a plane perpendicular to the cylinder axis. The equipment used in both cases included a transmitter and a receiver. The transmitter had a high-frequency generator that fed a signal containing 2, 4, and 8 mm wavelength components (providing adequate range for measurement of plasma densities up to  $10^{14}$  particles/cm<sup>2</sup>) to the transmitting antenna. The receiver consisted of an antenna, a frequency separator, detectors, preamplifiers, and oscillographs. The last recorded arrival times of each of the three pulse-component wavelengths at either fixed or varied

Card 1/2

UDC: 533.9.07

I. 03005-67

ACC NR: AP6033420

angular positions of the transmitter-receiver antennas relative to the cylinder axis. Spatial distribution densities calculated from the above data varied between  $10^{12}$  and  $10^{14}$  particles/cm<sup>3</sup>. Orig. art. has: 10 figures and 11 formulas.

SUB CODE: 20/ SUBM DATE: 21Oct65/ ORIG REF: 005/ OTH REF: 002/ ATD PRESS: 5099

Card 2/2 awm

ACC NR: APG033414 SOURCE CODE: UR/0057/66/036/010/1800/1807

AUTHOR: Grigorenko, V.G.; Dushin, L.A.; Pavlichenko, O.S.; Skibenko, A.I.

ORG: none

TITLE: Anomalous decay of the plasma of an oscillating electron (PIG reflex) discharge in a strong magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 10, 1966, 1800-1807

TOPIC TAGS: hydrogen plasma, gas discharge, plasma decay, electron oscillation, Penning discharge, plasma magnetic field, plasma stability, turbulent plasma

ABSTRACT: The authors have investigated the decay of the plasmas from pulsed PIG reflex discharges in hydrogen at from 0.001 to 0.1 mm Hg in magnetic fields up to 7 kOe. The 6 cm diameter aluminum cathodes were mounted 108 cm apart and 13 cm from ring anodes in a 10 cm diameter glass discharge tube. The plasma was excited by the up to 4 kV discharge of a 200 microfarad capacitor, the duration of the current pulse being 150 microsec. The plasmas were investigated with an 8 mm wavelength microwave interferometer. From the interferometer data the rate of decay of the plasma was obtained as a function of the magnetic field strength, the discharge voltage, and the hydrogen pressure. The radial distribution of the plasma density was also measured. The results are presented graphically and are discussed. At magnetic field strengths below 1 kOe the plasma decayed in accordance with the usual diffusion theory. The rate of plasma decay was minimum at a critical magnetic field strength (above 1 kOe) UDC: 533.9

Card 1/2

ACC NR: AP6033414

which was independent of the plasma density but decreased with increasing gas pressure. The signal of the microwave interferometer was found to be modulated at a frequency which decreased with time from about 2 MHz to 0.4 MHz. It is concluded that the anomalously rapid decay of the plasma is due to large scale drift instabilities that develop during the current pulse. These instabilities also lead to a turbulent condition of finite duration which the authors intend to investigate. Orig. art. has: 5 formulas and 10 figures.

SUB CODE: 20

SUBM DATE: 21Oct65

ORIG. REF: 011

OTH REF: 001

Card 2/2



DUSHIN, N. V.

DUSHIN, N. V. : "The formation of two and three pi-mesons in the encounter of pi-particles and photons with nucleons and deuterons." Min Higher Education USSR. Leningrad Polytechnic Inst imeni M. I. Kalinin. Leningrad, 1956. (Dissertation for the Degree of Candidate in Physicomathematical Science)

Source: Knizhnaya letopis' No. 28 1956 Moscow

"APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R000411620003-4

DUSHIM, N. V.

APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R000411620003-4"

**"APPROVED FOR RELEASE: 08/25/2000**

**CIA-RDP86-00513R000411620003-4**

**APPROVED FOR RELEASE: 08/25/2000**

**CIA-RDP86-00513R000411620003-4"**

DUSHIN, N.V.

SUBJECT  
AUTHOR  
TITLE  
PERIODICAL

USSR / PHYSICS

CARD 1 / 2

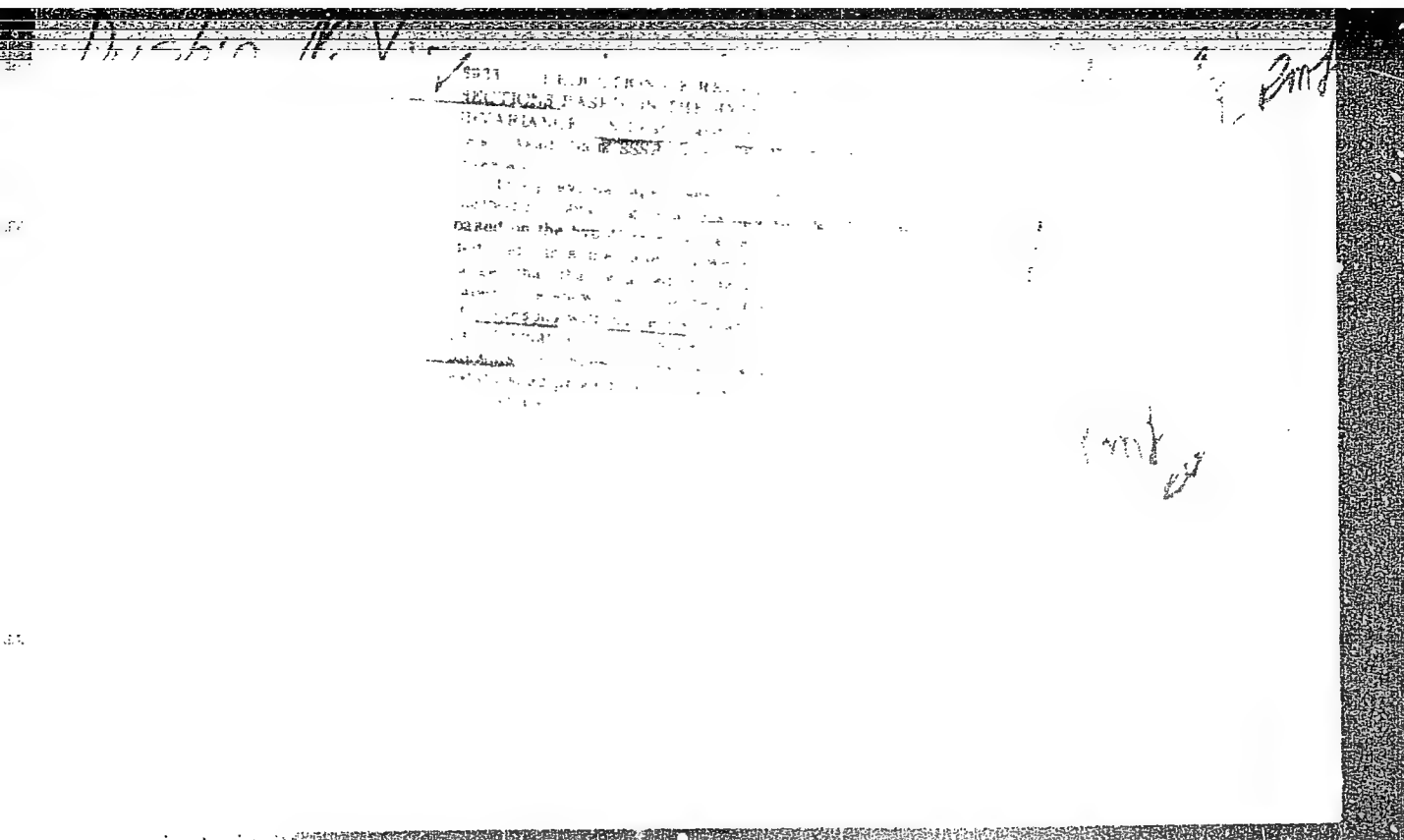
PA - 1543

DUSHIN, N.V.

The Photoproduction of Pion Pairs in Hydrogen and Deuterium near the Threshold and Isotopic Invariance.

Zurn. eksp. i teor. fiz. 31, fasc. 2, 355-356 (1956)  
Issued: 10 / 1956

On the occasion of the determination of the cross section of this photoproduction the interaction of the electromagnetic field with the meson-nucleon system is studied in first perturbational approximation. The corresponding interaction operator consists of two parts:  $H = S + V_3$ . The operator  $S$  characterizes the transitions into the state of the meson-nucleon system with the isotopic spin  $t = 1/2$ , the operator  $V_3$  into the states with  $t = 1/2$  and  $t = 3/2$ . Next, the cross sections of the following reactions are expressed explicitly with the help of these operators:  $\sigma_1(\gamma + p \rightarrow p + \pi^0 + \pi^0)$ ,  $\sigma_2(\gamma + p \rightarrow p + \pi^+ + \pi^-)$ ,  $\sigma_3(\gamma + p \rightarrow n + \pi^+ + \pi^0)$ . Near the threshold of the processes investigated the isotopic spin  $T$  of the system of the two pions can be equal to 0 or 2. The wave functions with  $T = 0$  and 2 are symmetric in the charge variables of the pions, and consequently also with respect to the coordinates of the pions. The wave function of the state with  $T=1$  is antisymmetric with respect to the charge variables and coordinates of the pions. Near the threshold of the reaction  $\gamma + p \rightarrow n' + \pi' + \pi''$  the pions are produced in the S-state, and the production of two pions with  $T = 1$  is there forbidden. Next some inequalities between the differential and between the total cross



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APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R000411620003-4"

21(1), 24(5)

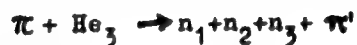
AUTHOR: Dushin, N.V.

SOV/155-58-2-35/47

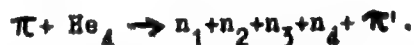
TITLE: Dispersion of  $\pi$ -Mesons in  $\text{He}_3$  and  $\text{He}_4$  (Rasseyaniye  $\pi$ -mezonov v  $\text{He}_3$  i  $\text{He}_4$ )

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 2, pp 162-165 (USSR)

ABSTRACT: The author considers the dispersion of the  $\pi$ -mesons in  $\text{He}_3$ :



and in  $\text{He}_4$ :



For the first case the author calculates eight, in the second case five different differential effective cross sections for several processes, and numerous relations between the total effective cross sections are established. The author uses the method of I.M.Shmushkevich [Ref 2,3].

There are 3 Soviet references.

ASSOCIATION: Leningradskiy politekhnicheskij institut (Leningrad Polytechnical Institute)  
Card 1/2



Dispersion of  $\pi$ -Mesons in  $\text{He}_3$  and  $\text{He}_4$

SOV/155-58-2-35/47

SUBMITTED: January 5, 1958

Card 2/2

DUSHIN, N.V.

Formation of  $\pi$ -meson pairs during collisions of  $\pi$ -mesons with  $\text{He}_3$  and  $\text{He}_4$ . Izv. vys. ucheb. zav.; fiz. no.3:21-29 '58. (MIRA 11:9)

1. Leningradskiy politekhnicheskiy institut.  
(Mesons) (Helium) (Collisions (Nuclear physics))

DUSHIN, N.V.

Formation of three  $\pi$ -particles during collisions of  $\pi$ -particles  
and photons with nucleons and deuterons. Izv. vys. ucheb. zav.;  
fiz. no.3:67-75 '58. (MIRA 11:9)

1. Leningradskiy politekhnicheskii institut.  
(Collisions (Nuclear physics)) (Particles, Elementary)

AUTHOR: Dushin, N. V.

SOV/139-58-4-18/30

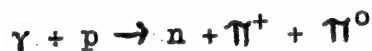
TITLE: Photoproduction of  $\pi$ -Meson Pairs in Hydrogen and Deuterium (Fotoobrazovaniye  $\pi$ - Mezonnykh par v vodorode i deyterii)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, 1958, Nr 4, pp 114-119 (USSR)

ABSTRACT: This paper calculates the ratio of the two differential cross-sections:

$$\frac{d\sigma(\gamma + d \rightarrow p + n + \pi^+ \pi^-)}{d\sigma(\gamma + p \rightarrow p + \pi^+ + \pi^-)}$$

The method employed is a development of that introduced by Pomeranchuk and Berestetskiy, and independently by Chew (Ref 1); and first applied to photo-reactions by Ioffe (Ref 2). In the present paper the method is first applied by way of illustration to the reaction:



Card1/4 since the effective potential  $V$  assumes here a

SOV/139-58-4-18/30

Photoproduction of  $\pi$ -Meson Pairs in Hydrogen and Deuterium

relatively simple form, namely:

$$V = [\underline{B}, \underline{\varepsilon}] \sigma \delta(r_n - r) \tau_n$$

Here  $\underline{B}$  is the vector  $a_{12} \underline{k}_1 + a_{21} \underline{k}_2$  associated with the incident  $\gamma$ -quantum having propagation and polarization vectors  $\underline{k}_0, \underline{\varepsilon}$  respectively;  $\sigma$  is the standard spin operator for the system,  $\delta(r_n - r)$  the Dirac delta function referred to the nuclear co-ordinate  $r_n$ , and  $\tau_n$  a creation operator referring to the creation of the meson pair, in this case  $\pi^+ + \pi^0$ . For  $\pi^+ + \pi^-$  pair production  $\tau_n$  breaks down into positive and negative parts; and for the deuteron reaction  $V$  breaks down into neutron and proton parts. The basic equation for  $d\sigma$  (Eq.3) is:

$$d\sigma = \frac{2\pi}{c} |[\underline{B}_p, \underline{\varepsilon}]|^2 \delta(E_0 - E_f) \frac{d\underline{k}_1}{(2\pi)^3} \cdot \frac{d\underline{k}_2}{(2\pi)^3}.$$

Card2/4

SOV/139-58-4-18/30

# Photoproduction of $\pi$ -Meson Pairs in Hydrogen and Deuterium

Here  $E_0$  and  $E_f$  are the initial and final nuclear energies and the other symbols are as defined above. The interaction Hamiltonian for the complete system in general includes a tensor term  $S$  as well as the central potential  $V$ . This Hamiltonian evaluated between the initial and final states leads to the  $[[B, \epsilon]]^2$  term;  $E_0$  and  $E_f$  then follow from the usual kinetics. Because of indeterminate normalization factors the absolute evaluation of  $d\sigma$  is not attempted; the ratio is evaluated as (Eq.31):

$$\frac{d\sigma(\gamma + d \rightarrow p + n + \pi^+ \pi^-)}{d\sigma(\gamma + p \rightarrow p + \pi^+ \pi^-)} = 2 \left( 1 - \frac{1}{3} \frac{\alpha}{\kappa} \arctg \frac{\kappa}{\alpha} \right)$$

where  $\alpha$  is the fine structure constant and  $\kappa = \frac{1}{2} (\underline{k}_0 -$

$- \underline{k}_1 - \underline{k}_2)$ . It is also noted that:

$$d\sigma(\gamma + d \rightarrow d + \pi^+ + \pi^-) \ll d\sigma(\gamma + d \rightarrow p + n + \pi^+ + \pi^-)$$

Card3/4 so that Eq.(31) represents accurately the relative

SOV/139-58-4-18/30

Photoproduction of  $\pi$ -Meson Pairs in Hydrogen and Deuterium

photoproduction of  $\pi$ -meson pairs in deuterium and hydrogen.  
Acknowledgments are made to I. M. Shmushkevich.  
There are 8 references, 5 of which are Soviet, 3 English.

ASSOCIATION: Leningradskiy politekhnicheskiy institut  
(Leningrad Polytechnical Institute)

SUBMITTED: December 23, 1957

Card 4/4

AUTHOR: Dushin, N. V.

56-34-4-21/60

TITLE: On the Relations Between the Cross Sections of the Multiple Production of Pions (O sootnosheniyakh mezhdu secheniyami mnozhestvennogo obrazovaniya  $\pi$ -mezonov)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 916 - 921 (USSR)

ABSTRACT: This work shows the following: Between the cross sections of the various reactions for the production of three pions in the collision of pions with nucleons and deuterons near the threshold value and also in the production of pions with equal momenta additional relationship are valid. The author investigates collisions of pions with nucleons ( $n$ ) where the pion turns into 3 pions:  $\pi + n \rightarrow n' + \pi'' + \pi'''$ . The initial state is a superposition of states with the isotopic spin  $T = 1/2$  and  $T = 3/2$ . The wave function of the systems of 3 pions is a superposition of states with the isotopic spin  $t = 0, 1, 2, 3$ . The state with the isotopic spin  $t = 3$  is forbidden. The symmetrical state of the system of 3 pions with regard to an arbitrary pair of permutations of the charge variable is the state with the total isotopic spin  $t = 1$ . First the relationships for the differential

Card 1/3



On the Relations Between the Cross Sections of the  
Multiple Production of Pions

56-34-4-21/60

cross sections  $\sigma$  of the various processes are written down. From this result 2(given) relations between the total cross sections  $\sigma^t$ . Then the author gives some relations between the differential cross sections and also between the total cross sections near the threshold of the reaction. The same relations are valid also far from the threshold of the reaction if the 3 pions form in the reaction  $\pi + n \rightarrow n' + \pi' + \pi'' + \pi'''$  with same momenta. Then the author examines the transformation of a pion into 3 particles in collisions of pions with deuterons, i.e. the reaction  $\pi + d \rightarrow n' + n'' + \pi' + \pi'' + \pi'''$ . Also for this case the terms for the differential and for the total cross sections are given. Then the author gives relations between the differential and between the total cross sections. Especially also relations are given which are valid near the threshold value of the examined reaction and in the case of equal momenta of the 3 pions. Then the author investigates the reactions of the photoproduction of 3 pions in hydrogen and deuterium. The expressions for the differential cross sections and the relations between the differential and between the total cross sections are written down. Then the cross section of the photoproduction

Card 2/3

On the Relations Between the Cross Sections of the  
Multiple Production of Pions

56-34-4-21/60

of three pions in deuterium is ascertained. Also for this case the same terms and relations as in the cases discussed before are given. Finally the author thanks Professor I. M. Shmushkevich for the discussion of the results and for his advice in the performance of this work. There are 5 references, 4 of which are Soviet.

ASSOCIATION: Leningradskiy politekhnicheskii institut (Leningrad Polytechnical Institute)

SUBMITTED: November 8, 1957

1. Neutron cross sections--Electromagnetic effects

Card 3/3

24 (5), 21(0)

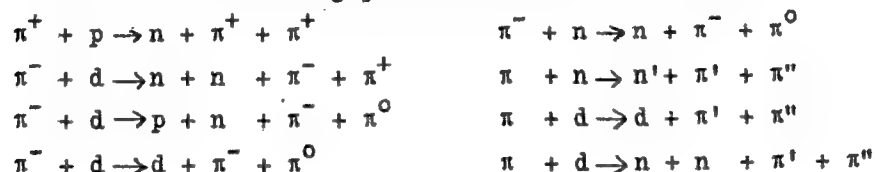
AUTHOR: Dushin, N. V.

SOV/56-35-2-13/60

TITLE: ~~The Forming of Two  $\pi$~~  Particles in Collisions Between  
 $\pi$ -Mesons and  $\gamma$ -Quanta With Nucleons or Deuterons  
 (Obrazovaniye dvukh  $\pi$ -chastits pri stolknoveniyakh  
 $\pi$ -mezonov i  $\gamma$ -kvantov s nuklonami i deytronami)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958,  
 Vol 35, Nr 2, pp 401-407 (USSR)

ABSTRACT: With the aid of a phenomenological theory a number of  
 reactions for pions emitted at small angles is investigated,  
 and expressions for the amplitudes, the differential cross  
 sections, the wave vectors, and, in the last case, also for  
 the distribution function  $W(p_1, \vec{k}_1, \vec{k}_2)$  of the nucleons is  
 derived. The following processes are dealt with:



Card 1/2

The Forming of Two  $\pi$  Particles in Collisions Between  
 $\pi$ -Mesons and  $\gamma$ -Quanta With Nucleons or Deuterons

SOV/56-35-2-13/60

$$\pi + d \rightarrow p + n + \pi' + \pi''$$

$$\pi^- + p \rightarrow p + \pi^- + \pi^0$$

In conclusion, the author thanks I. M. Shmushkevich for  
his advice. There are 3 references, 3 of which are Soviet.

ASSOCIATION: Leningradskiy politekhnicheskij institut (Leningrad  
Polytechnic Institute)

SUBMITTED: March 3, 1958

Card 2/2

S/563/61/000/217/010/012  
D234/D308

AUTHORS: Dushin, N. V., and Stepanyants, L. G.  
TITLE: Hydrodynamical design of a cylindrical suspension  
SOURCE: Leningrad. Politekhnikheskiy institut. Trudy.  
no. 217. 1961. Tekhnicheskaya gidromekhanika,  
133-139

TEXT: The authors describe a method of design based on replacing the holes used for introducing the liquid or gas into the gap between the floating element and the casing by a system of point sources with given flow rates. A suspension with cylindrical floating element of finite length and a corresponding cylindrical casing is analyzed; it is assumed that the axis of the floating element remains parallel to the axis of the casing. There is 1 figure. ✓

Card 1/1

S/120/62/000/001/006/061  
EO32/E514

AUTHORS: Andreyev, A.P. and Dushin, N.V.

TITLE: Distribution of density in a diffusion chamber

PERIODICAL: Pribery i tekhnika eksperimenta, no.1, 1962, 37-40

TEXT: The authors discuss the operation of a diffusion chamber under optimum operating conditions which are defined as follows: the vapour pressure  $P(T)$  in the sensitive region of the chamber is greater than the vapour pressure  $P_0(T)$  which is the limiting pressure for the formation of drops of charged nuclei and at the same time does not exceed the vapour pressure  $P^0(T)$  which is the limiting pressure in the spontaneous formation of drops on uncharged nuclei. The theory of the diffusion chamber under these conditions is considerably simplified if it is assumed that there is no condensation. The  $P(T)$  and  $P^0(T)$  curves then have a common point of contact at  $T = T_k$ , which corresponds to optimum operation at the latter point. Using the results of Igor Saaverda (Ref.9: Nucl. Instrum., 1958, 3, 85) and D. A. Frank-Kamenetskiy (Ref.10: Diffusion and heat transfer in chemical kinetics [Diffuziya i teploperedacha v khimicheskoy Card 1/2

Distribution of density in a ... S/120/62/000/001/006/061  
E032/E514

kinetike], 1947, Izd-vo AN SSSR) the authors derive an expression for the vapour density distribution with height in the absence of condensation. The theoretical formulae are then used to obtain numerical results for  $\text{CH}_3\text{OH} - \text{H}_2$  at a total pressure of 100 atm. There are 3 figures and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiiy institut AN SSSR  
(Physico-technical Institute AS USSR)

SUBMITTED: December 30, 1960

50

Card 2/2

24.6610

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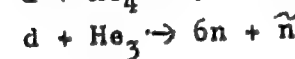
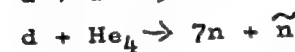
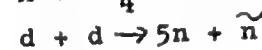
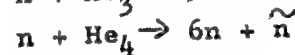
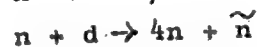
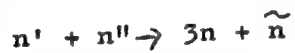
S/139/62/000/002/008/028  
E032/E514

AUTHOR: Dushin, N.V.

TITLE: Production of antinucleons in collisions of nucleons and deuterons with  $H_1$ ,  $D_2$ ,  $He_3$  and  $He_4$

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, no.2, 1962, 44-46

TEXT: The author considers the following antinucleon production reactions:



✓B

Card 1/2



Production of antinucleons ...

S/139/62/000/002/008/028  
E032/E514

Simple inequalities are derived for the differential and total reaction cross-sections for the above processes, for example, it is shown that

$$3 [\sigma_2(p + p \rightarrow 2p + n + \bar{n}) + \sigma_3(p + n \rightarrow 2p + n + \bar{p})] \geq \sigma_1(p + p \rightarrow 3p + \bar{p})$$

where the  $\sigma$ 's refer to the differential cross-sections.

ASSOCIATION: Leningradskiy politekhnicheskii institut imeni  
M. I. Kalinina  
(Leningrad Polytechnic Institute imeni  
M. I. Kalinin)

SUBMITTED: December 12, 1960

Card 2/2

DUSHIN, N.V.; STEPANYANTS, L.G.

Hydrodynamic analysis of a cylindrical suspension. Trudy LPI  
no.217:133-139 '61. (MIRA 15:3)  
(Fluid mechanics) (Gas lubricated bearings)

DUSHIN, N.V.

Conformal Euclidean representation of Riemann spaces and the  
equations of hydrodynamics. Trudy LPI no.230:27-29 '64.  
(MIRA 17:6)

ZININA, M.A.; DUSHIN, V.A.

Production of furfurole from kenaf scutched tow. Gidroliz. i  
lesokhim. prom. 18 no.5:21-22 '65. (MIRA 18:7)

1. Yangi-Yul'skiy gidroliznyy zavod.

DUSHKIN, V. A.

"The Effect of Biogenic Stimulators on the Appearance of a  
Tuberculin Reaction in an Intracutaneous Test on Cattle." Cand Vet  
Sci, Leningrad Veterinary Inst, Leningrad, 1953. RZhBiol, No 5, Mar 55)

SO: Sum. No. 670, 29 Sep 55—Survey of Scientific and Technical  
Dissertations Defended at USSR Higher Educational Institutions (15)

DUSHKIN, V. A.

"Modification of the morphological composition of blood in rabbits in their artificial infection with *Cryptococcus farciminosus* cultures", (Aspirant, Epizootiology Department), Collected Works No. 14, Leningrad Veterinary Institute USSR Ministry of Agriculture, P 250, Sel'khozgiz, 1954.

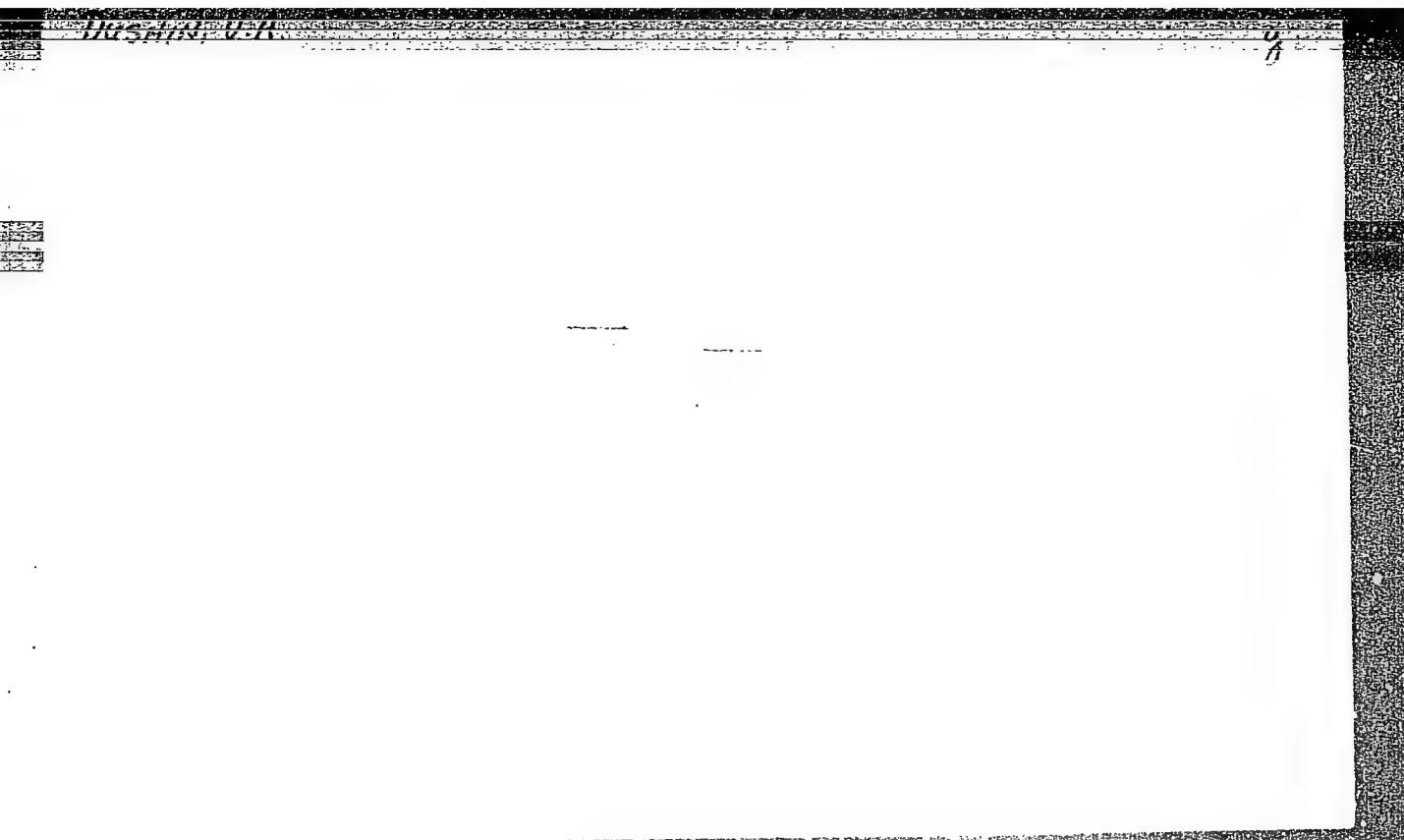
POLYANSKIY, B.A.; DUSHKINA, V.A.

Massive exchange blood transfusion in the treatment of mercuric chloride ~~ne~~ nephrosis. Probl.gemat.i perel.krovi no.9:51-56  
'61. (MIRA 14:9)

1. Iz kliniki obshchey khirurgii (zav. - doktor med.nauk B.A. Polyanskiy) Novosibirskogo meditsinskogo instituta (dir. - prof. G.D. Zaleskiy) i terapevticheskogo otdeleniya 9-y gorodskoy bol'nitsy (glavnyy vrach A.I. Fedorova).  
(MERCURY CHLORIDES—TOXICOLOGY) (BLOOD—TRANSFUSION)  
(KIDNEYS—DISEASES)

"APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R000411620003-4



APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R000411620003-4"



USMANOV, Kh.U.; MININA, V.S.; DUSHIN, V.A.; ZIMINA, M.A.

Costra kenaf (*Hibiscus cannabinus*) as new raw material for  
the production of furfureole and protein fodder. Uzb.khim.zhur.  
6 no.2:79-80 '62. (MIRA 15:7)

1. Institut khimii polimerov AN UzSSR i Yangiyul'skiy gidroliznyy  
zavod.

(Kenaf)

(Feeding and feeds)

(Furaldehyde)

ZININA, M.A.; DUSHIN, V.A.

Pentose and hexose hydrolysis of ambary hemp chaff. Gidroliz. i  
lesokhim.prom. 17 no.8:25-27 '64. (MIRA 18:1)

1. Yangi-Yul'skiy gidroliznyy zavod.

DUSHIN, V.N., starshiy prepodavatel'

Fundamentals of the theory of the performance of electric cyclones  
with corona discharge. Trudy MTIPP no.19:85-93 '62. (MIRA 17:4)

BELOTSERKOVSKY, O. M.; GOLOMAZOV, M. M.; DUSHIN, V. K.; IVANOV, V. R. (Moscow)

"Supersonic gas flow around blunt bodies"

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 Jan - 5 Feb 1964.

ACCESSION NR: AP4012004

S/0208/64/004/001/0061/0077

AUTHORS: Belotserkovskiy, O. M. (Moscow); Dushin, V. K. (Moscow)

TITLE: Nonequilibrium supersonic flow over blunt bodies

SOURCE: Zhurnal vychisl. matem. i matem. fiz., v. 4, no. 1, 1964, 61-77

TOPIC TAGS: nonequilibrium, supersonic flow, blunt body, axially symmetric, shock wave, oxygen concentration

ABSTRACT: The method of functional approximation along the shock wave has been used to study the flow characteristics of nonequilibrium supersonic flow over a blunt body. The gas is assumed to have  $\mu$ -components containing  $\lambda$ -different types of atoms, flowing along an axially symmetric body at zero angle of attack with constant velocity  $W_\infty$ . Viscosity, diffusion, and thermal conductivity are neglected. A body-centered orthogonal system has been used (see Enclosure) with one streamline and two family characteristics given by

$$\frac{dS_{n,1}}{dt} = \frac{v}{A_n - t_{s,1}}$$

$$\frac{dS_1}{dt} = \frac{v}{A_1(\beta \pm \alpha) - t_{s,1}}$$

Card 1/4

ACCESSION NR: AP4012004

where

$$\beta = \arctg(u/v), \quad \alpha = \arcsin(\alpha_{\infty}/W).$$

The integration domain for the inviscid flow equation is given by

$$0 < \xi < 1, \quad 0 < S < S_1(\xi).$$

The approximation method used by O. M. Belotserkovskiy and P. I. Chushkin (Chislennyy metod integral'nykh sootnosheniy. Zh. vychisl. matem. i matem. fiz., 1962, 2, No. 5, 731-759) is applied to reduce the partial differential equations into six ordinary differential equations suitable for numerical computation. Calculations are extended to approximations of second order ( $N = 2$ ), and the structure of the shock wave for  $M_{\infty} = 10$ ,  $p_{\infty} = 0.001$  and  $0.01$  atm,  $T = 288K$  is determined. Temperature and oxygen concentration curves in the shock layer along the stagnation streamline are also given, using the dissociative relaxation equation in the form

$$\frac{dC_{O_2}}{ds} = - \frac{p}{\pi_{O_2}} [2C_{O_2}C_{O_2}K_D(O_2, 0) + C_{O_2}K_D(O_2, 0)] \left[ 1 - \frac{u_{O_2}}{u_{O_2} - u_{O_2}} \frac{p}{p_0} \right].$$

Card 2/4

ACCESSION NR: APL012004

The solution is found to be stable. "The authors are grateful to Yu. P. Lun'kin for his help in the nonequilibrium flow calculations." Orig. art. has: 25 equations, 10 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 26Aug63

DATE ACQ: 14Feb64

ENCL: 01

SUB CODE: AS

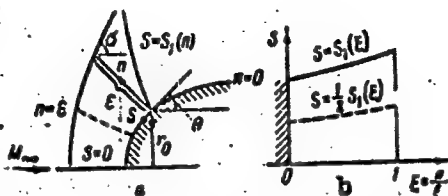
NO REF SOV: 008

OTHER: 001

Card 3/4

ACCESSION NR: AP4012004

ENCLOSURE: 01



Card 4/4



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Card 1/2

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**APPROVED FOR RELEASE: 08/25/2000**

**CIA-RDP86-00513R000411620003-4"**

ACC NR: AT6034342

SOURCE CODE: UR/0000/66/000/000/0194/0199

AUTHOR: Dushin, V. K. (Moscow)

ORG: none

TITLE: Application of the method of characteristics to supersonic external flows in the presence of nonequilibrium processes

SOURCE: Chislennyye metody resheniya zadach matematicheskoy fiziki (Numerical methods of solving problems in mathematical physics); sbornik statey. Moscow, Izd-vo Nauka, 1966, 194-199

TOPIC TAGS: supersonic aerodynamics, supersonic flow, nonequilibrium flow, flow field, equilibrium flow, vibrational relaxation, ionization, EXTERNAL FLOW, *AXISYMMETRIC BODY*

ABSTRACT: This paper presents a two-dimensional method of characteristics for calculating the supersonic region of a flow over an axisymmetric body at zero angle of attack, with nonequilibrium chemical transformations taken into account. A system of equations is considered which makes it possible to carry out computations of a many-component gas flow in both nonequilibrium (chemically) and totally equilibrium states, according to a single program. Data necessary for computing the supersonic region of the flow were obtained from computing the region affected by body bluntness according to scheme II of the method of integral relations developed by O. M. Belotserkovskiy and V. K. Dashin (Vychislitel'naya Matematika i Matematicheskaya

Card 1/2

UDC: 517.9:533.011

ACC NR: AT6034342

Fizika, v. 4, no. 1, 1964). The results of computations of the supersonic region near a sphere and cylinder with spherical bluntness in oxygen at  $M = 10$  in the cases of nonequilibrium dissociating and equilibrium gases, which are presented in graphs, show that violation of the equilibrium of chemical transformations has almost no effect on pressure distribution, but appreciable deviations of the temperature and concentrations of the components were observed from the computed values of these parameters obtained under the assumption of equilibrium chemical reactions. It is stated that the system of equations derived here may be extended to calculating supersonic flows in the presence of vibrational relaxation and nonequilibrium ionization. Orig. art. has: 5 figures and 9 formulas.

SUB CODE: 20/ SUBM DATE: 03Aug65/ ORIG REF: 005/ OTH REF: 002

Card 2/2

FREME, Andrey Vladimirovich; DUSHIN, Ye.M., red.; ZABODINA, A.A.,  
tekhn.red.

[Telemetering] Teleizmereniia. Moskva, Gos. energ. izd-vo,  
1958. 304 p. (MIRA 12:1)  
(Telemetering)

DUSHIN, Ye. M.

BUTUSOV, Ivan Vasil'yevich; VAVILOV, A.A., red.; DUSHIN, Ye. M., red.;  
DOLMATOV, P.S., vedushchiy red.; YASHCHURZHINSKAYA, A.B., tekhn.  
red.

[Automatic measuring and regulating instruments] Avtomaticheskie  
kontrol'no-izmeritel'nye i reguliruiushchie pribory. Leningrad,  
Gos. nauchno-tekhn. izd-vo neft. i gorno-toplivnoi lit-ry,  
Leningr. otd-nie, 1958. 388 p. (MIRA 11:5)  
(Measuring instruments)

DUSHIN, YE. M.

807/144-58-9-18/18

**AUTHOR:** Gikis, A. P., Candidate of Technical Sciences, Docent  
**TITLE:** Inter-University Scientific Conference on Electric Measuring Instruments and Technical Means of Automation (Mezhvuzovskaya nauchnaya konferentsiya po elektromeritel'nyy priboram i tekhnicheskim sredstvam avtomatiki)

**PERIODICAL:** Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, 1958, Nr 9, pp 130-135 (USSR)

**ABSTRACT:** The conference was held at the Leningradskiy elektrotekhnicheskii institut imeni V. I. Ul'yanova (Lenina) (Leningrad Electro-technical Institute imeni V. I. Ul'yanov (Lenin)) on November 11-15, 1958. The representatives of eleven higher teaching establishments and three research institutes participated and a large number of specialists of various industrial undertakings were present.

Docent B. M. Smolov (Leningrad Electro-Technical Institute) read the paper "Non-linear electronic voltage transformers with a numerical output", in which he considered two methods of transforming voltages into a numerical code.

V. F. Skuridin (Ural Polytechnical Institute imeni B. M. Kirov) presented the paper "New counters based on polarized relays". These do not suffer from the

disadvantage of existing counters, namely, that the results are lost if the current supply is accidentally interrupted.

Professor A. V. Frenke and Docent Ye. M. Dushin (Leningrad Electro-Technical Institute) presented the paper "Metering transducers for automatic instruments with discrete types of recording".

Candidate of Technical Sciences V. B. Ushakov and P. B. Kopylov (Scientific Research Institute for Computers) presented the paper "Computing equipment for automatic centralized control of production parameters". Candidate of Technical Sciences V. B. Ushakov presented the paper "Certain trends in the development of analogue computers and of computing devices intended for use in industry".

9 (7), 9 (6)

AUTHORS:

Dushin, Ye. M., Candidate of Technical Sciences, SOV/119-59-8-3/15  
Fremke, A. V., Doctor of Technical Sciences

TITLE:

Measurement Transformers with Unified Signal

PERIODICAL:

Priborostroyeniye, 1959, Nr 8, pp 7-11 (USSR)

ABSTRACT:

In the introduction the basic mode of operation of electric measuring systems is briefly described, and the demands which must be made on such circuits are enumerated: 1. Independent of the quantity to be measured the initial signals of the measurement transformer should be uniform. 2. A linear characteristic of measurement transformers is required. 3. It must be possible to connect them to automatic circuits. 4. The construction must be suited for use in masses. Formula (1) expresses the error of the signal in %, and possible causes for the signal error are given. The following quantities may be used as signals: 1. The voltage or the amperage of a direct current. 2. The frequency of alternating current. 3. Direct current pulses. In the case of the latter, both the pulse amplitude, the duration of the pulses, the number of pulses or combination of different kind of pulses may be used. In the present paper only static compensation-transformers are investigated. Measurement transformers are subdivided

Card 1/3



Measurement Transformers with Unified Signal

SOV/119-59-8-3/15

into two groups: Generator- and parameter-measurement transformers. The former need no feeding because for the production of their e.m.f. they use up energy of the quantity to be measured. In the case of parameter transformers an arbitrary parameter of the electric circuit is changed, and for such a transformer a current source is necessary. As examples, the schemes of a generator transformer (Fig 1) and of a parameter transformer (Fig 2) are shown, their mode of operation is discussed, and the formulas for calculation are derived. As examples, the static compensation transformers worked out at the elektroizmeritel'nyy laboratoriya Leningradskogo elektromekhanicheskogo instituta imeni V. I. Ul'yanova (Lenina) (Electro-measuring Laboratory of the Leningrad Electromechanical Institute imeni V. I. Ul'yanov (Lenin)) for thermocouples and resistance thermometers are described. The thermocouples belong to the group of generator transformers, and figure 3 shows the wiring scheme of the here described transformer. The latter consists of the thermocouple proper, a three-step amplifier, a phase-sensitive rectifier, and for the elimination of nonlinearities it has an electronic function transformer. For the compensation of the nonlinearity of the thermocouple characteristic caused by temperature variations at

Card 2/3

Measurement Transformers with Unified Signal

SOV/119-59-8-3/15

the cold junctions a compensation bridge is used. In conclusion, a resistance thermometer, the wiring scheme of which is shown by figure 5, is dealt with. By means of a shunt, the sensitivity of this transformer may be varied within a wide range. For the amplification of the signals a three-step alternating current amplifier, to which a vibro-transformer is connected, is used. There are 6 figures and 3 Soviet references.

Card 3/3

DUSHIN, Ye.M., kand.tekhn.nauk, dots.

Secondary converter for resistance thermometers. Izv.vys.ucheb.zav.;  
prib. no.1:13-21 '59. (MIRA 12:11)

1. Leningradskiy elektrotekhnicheskij institut im. V.I. Ul'yanova  
(Lenina).

(Pyrometers)

DUSHIN, Ye.M.; ARTEM'YEV, V.Ya.

Galvanometer-type amplifier equipped with an inductive converter.  
Izv.vys.ucheb. zav.; prib. 3 no.3:15-26 '60. (MIRA 14:4)

1. Leningradskiy elektrotekhnicheskoy institut imeni V.I.Ul'yanova  
(Lenina). Rekomendovana kafedroy elektroizmeritel'noy tekhniki.  
(Amplifiers, Electron tube)

BAYDA, Leonid Il'ich; DOBROTVORSKIY, Nikolay Stepanovich; DUSHIN, Yevgeniy Mikhaylovich; MOKIYENKO, Dobroslava Nikolayevna; PREOBRAZHENSKIY Aleksey Alekseyevich; PCHELINSKAYA, Sof'ya Nikodimovna; STAROSEL'TSEVA, Yelena Aleksandrovna; FREMKE, Andrey Vladimirovich, doktor tekhn. nauk, prof.; ORSHANSKIY, D.L.; PREOBRAZHENSKIY, A.A., red.; SOBOLEVA, Ye.M., tekhn.red.

[Electrical measurements; a general course] Elektricheskie izmereniia; obshchii kurs. Izd.3., perer. i dop. [By] L.I. Baida i dr. Moskva, Gosenergoizdat, 1963. 428 p.  
(MIRA 17:3)

1. The following are the main types of converters:

a. Current-type converters

1. Current-type a-c current and voltage

2. Current-type d-c current and voltage

3. Current-type d-c current and voltage

4. Current-type d-c current and voltage

5. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)

6. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)

7. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)

8. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)

9. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)

10. Measuring a-c/d-c current and voltage converters with standardized (0-5 ma)



DUSHIN, Ye.M.; ARTEM'YEV, V.Ya.

Measuring a.c. and voltage converters with a unified output signal.  
Izv.vys.ucheb.zav.; prib. 8 no.1:32-36 '65.

(MIRA 18:3)

1. Leningradskiy elektrotekhnicheskoy institut imeni Ul'yanova  
(lenina). Rekomendovana kafedroy elektroizmeritel'noy tekhniki.



DUSHIN, Yu.A.

Heatproof shields with overhanging lining. Inzh.-fiz. zhur. 8  
no.3:330-335 Mr '65. (MIRA 18:5)

1. Mekhanicheskiy institut, Leningrad.

27562

S/170/61/004/010/017/019  
B108/B102

11.2000 also 3619

AUTHOR: Dushin, Yu. A.

TITLE: Disintegration (combustion) rate of polymers in a hot gas

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4; no. 10, 1961, 123-126

TEXT: In modern engineering, polymers are more and more used as heat protectives. It is therefore important to get information on their disintegration and/or combustion rates in a hot gas, particularly for temperatures above some 1000°C, and pressures of several atmospheres. In such cases, the theory of D. B. Spolding (Osnovy teorii goreniya, GEI, M.-L., 1959) is applicable. The disintegration rate may be written as

$$V = \frac{\alpha}{c_{p\infty} \gamma} \ln(1 + B) \quad (1),$$
 where  $\alpha$  denotes the heat transfer coefficient when

no gas is formed on the surface,  $c_{p\infty}$  is the specific heat of the surrounding gas,  $\gamma$  - the specific weight of the polymer.  $B = Q/F\beta + c_{p\infty}(t_{\infty} - t_{\text{surface}})/F$ ;  $Q$  denotes the combustion heat of the polymer,  $\beta$  - the stoichiometric

Card 1/3

27562

S/170/61/004/010/017/019

B108/B102

4

Disintegration (combustion) rate of ...

ratio of the gas to the polymer,  $F$  - the disintegration heat of the polymer,  $t_{\infty}$  - the temperature of the gas. The quantity  $F$  is unknown for the majority of polymers. It may, however, be estimated for additive polymers, since then  $F = 1000z/M$  in the case of complete depolymerization, i. e., equal to the heat of polymerization.  $z$  is the molar heat of polymerization,  $M$  - the molecular weight of the monomer. Generally,  $F = 1000zy/rM$  for additive polymers.  $r$  is the contribution of the monomer to the volume of the disintegration products,  $y$  denotes the weight contribution of depolymerized substance. The combustion heat of a polymer

is consequently given by  $Q_p = (Q_M - z) \frac{1000}{M}$ , where  $Q_M$  denotes the molar combustion heat of the monomer. In practice, the combustion heat of organic polymers may be calculated from the formula  $Q = \frac{26,050}{M} (4l_C + l_H - 2l_O)(4)$ .

This relation was obtained by a formula of Karosh.  $l$  denotes the number of atoms of the element indicated by the subscript contained in one molecule of the monomer. The stoichiometric ratio for an organic polymer

is given by  $\beta = \frac{M}{M_g} \frac{4l_C + l_H - 2l_O}{2n_O - 4n_C - n_H}$ .  $M_g$  is the molecular weight of the

Card 2/3

Disintegration (combustion) rate of ...

27562  
S/170/61/004/010/017/019  
B108/B102

surrounding gas,  $n$  is the number of atoms of the element indicated by the subscript contained per molecule of the gas. From these quantities one can find the transfer parameter for an additive organic polymer, replacing the specific heat  $c_{p,0}$  by the molar heat  $\bar{c}_{p,0}$  of the gas. The difference between the calculated and experimental values did not exceed 10%. A greater difference in the case of forced convection is due to the fact that Spolding's formula is not exactly valid in this case. There are 1 table and 2 Soviet references.

ASSOCIATION: Mekhanicheskii institut, g. Leningrad (Institute of Mechanics, Leningrad)

SUBMITTED: February 20, 1961

Card 3/3